

METHOD AND APPARATUS FOR THE SECURING OF
OBJECTS BY STRAPPING**Description**

5 This invention relates to a method of protecting objects against theft, in which at least one strapping means is looped around an object to be secured, with overlapping portions of the strapping means being joined together, and to an apparatus for the protection of objects against theft by encircling them with at least one strapping means, with a sealing device for sealing overlapping portions of a strap-
10 ping means encircling the object to be secured.

Items of merchandise offered for sale in sales rooms are being protected increasingly against theft by wrapping plastic bands around the packaging of the merchandise in order to prevent the merchandise being removed from its packaging and carried past the checkout counter unnoticed.

15 A method and an apparatus for the securing of articles by means of strapping are known, for example, from DE 195 16 043 A1. In a strapping machine described in this specification, a band conveying device shoots a plastic band at high velocity into a band guide partially surrounding the object to be secured. A loop is thereby formed which places itself around the object. The free end of the band is
20 captured by a band holder and securely fixed in place. The band conveying device then retracts the band in opposite direction. This causes the loop to be pulled tight around the object, resting snugly against its surface. By means of a tensioning device the band is tensioned and then, in tensioned condition, is sealed by a sealing device in a section of overlapping portions of the band.

25 Furthermore it is known to protect items of merchandise against theft with the aid of electronically detectable security elements which, as a rule, are applied to the packaging or directly to the object to be secured. Such security elements contain electrical, electronic and/or magnetic devices for emitting an electronically detectable signal. Suitable detecting devices produce alternating magnetic fields
30 which excite the security element into emitting a characteristic signal. This characteristic signal is then received by the detecting devices causing them to produce an alarm.

From EP 0 446 910 A1, for example, a security tag is known which is comprised of an electronically detectable, deactivatable security element and a self-adhesive coating covering it. The deactivatable security element is a soft magnetic strip element capable of being excited into emitting the characteristic signal and
5 having applied to it rectangular elements of a hard magnetic material. The hard magnetic material can be driven into saturation by a strong magnetic field and, due to its magnetization, prevent the soft magnetic material from responding, so that the security element can be deactivated when the merchandise has been rightly purchased. This security element is adhered to a peel strip for purposes of storage
10 and transportation. When the peel strip is removed, the security element with the then exposed adhesive coating can be adhered to an object to be secured. However, such a security tag has the disadvantage of being relatively easy to detach from the object to be secured or from its packaging.

It is an object of the present invention to provide a method and an apparatus
15 of the type initially referred to which afford effectiveness and economy in the securing of the objects to be protected.

Proceeding from a method of the type initially referred to, this object is accomplished according to the invention by feeding at least one electronically detectable security element to the strapping means in such manner that the security
20 element is enclosed between the overlapping portions.

With this approach of the invention it is ensured that the security element can no longer be readily removed from the secured article. According to the invention, the security element is enclosed between overlapping portions of the strapping means, which means that the entire strapping would have to be removed to remove
25 also the security element. A security element adhered to the packaging of the merchandise could be removed just as easily as a security element affixed on the strapping means. However, the strapping means is sealed invisibly and fixedly in a section of overlapping portions which in this section are joined together, so that a security element which according to the invention is enclosed in this particular section
30 of the strapping means cannot be removed. The joining of the overlapping portions may be accomplished, for example, by welding, whereby a very firm bond is obtained. Furthermore, the process of strapping the object to be secured may be combined with the process of applying a security element for electronic article

surveillance in one pass, resulting overall in a very fast and low-cost method for article protection.

The security elements involved may include, for example, electromagnetic (EM), acousto-magnetic (AM), radio frequency (RF) or radio frequency identification (RF-ID) elements. Therefore, according to the invention different types of security element may be used, with flat security elements as, for example, strip-shaped security elements or thin-film elements being preferred. These may be of the deactivatable type, enabling them to be deactivated at the checkout counter when the merchandise has been properly paid for. The use of strip or thin-film elements furthermore affords the advantage of having a thin layer thickness enabling them to be integrated into the strapping without problems.

In cases where EM, that is, electromagnetic, elements are used as security elements, the EM material may be a co-extruded material containing in the interior of a plastic coating a strip element ("simple strip") as deactivatable element or only active material. The plastic coating is made of commercially available, co-extrudable plastics capable of being fused with a plastic band from which the strapping may be formed.

In an advantageous aspect of the method of the invention provision is made for the security element to be fed to the strapping means prior to the strapping operation and to be applied to one of the overlapping portions. Accordingly, the security elements may already be affixed to the strapping means when the latter is presented to the strapping operation. This requires the security elements to be applied to the strapping means at suitable locations at a predetermined relative distance to ensure that they are positioned between the overlapping portions of the strapping means when these are joined together.

In another advantageous aspect of the method of the invention provision is made for the security element to be fed to the strapping means during the strapping operation and to be positioned intermediate the overlapping portions. This combines the operation of feeding the security elements directly with the strapping operation, so that the complete securing of the object takes place in one pass resulting in an extremely economical process.

This arrangement advantageously provides that as strapping means at least one loop made from a weldable, band-shaped strapping material is arranged in encircling relationship around the object, with the overlapping portions of the band-shaped strapping material forming a welding zone, and that a security element coated at least in part with a meltable material is introduced between the overlapping portions of the band-shaped strapping material in the welding zone, followed by welding the strapping material and the coated security element to one another in the welding zone, thereby sealing the loop. By welding the security element to the strapping material a very firm bond is established making it practically impossible for the security element to be removed. For welding a friction welding or ultrasonic welding process may be employed.

In an advantageous aspect of the method of the invention it is furthermore provided that the strapping means is fed by means of a conveying device to a band guide which surrounds the object at least in part and is routed through said guide, and/or that the strapping means is drawn off a supply reel and the loop is severed from the remaining supply of strapping material prior to or subsequent to the joining operation.

The security elements may be peeled from a supply reel, onto which they are wound in the form of a continuous strip, and fed to the strapping means. In the process, a single security element is severed from the continuous strip before or after it is enclosed within the strapping means.

Alternatively, the security elements may be presented as cut-to-size strip elements and fed to the strapping means one at a time.

When the object to be secured is strapped with two strapping means and in the process at least two security elements are affixed to the object at an angle of 90 degrees relative to each other, then the detection rate of the antennae of the detecting device at the exit of the sales room can be increased, enabling the effectiveness of the method of the invention to be enhanced still further.

Proceeding from an apparatus of the type initially referred to, the object is accomplished according to the invention in that it includes a device for applying at least one electronically detectable security element to the strapping means prior to it being sealed. With this applicator the function of a conventional strapping machine

can be further developed in advantageous manner such as to enable a combination of the feeding of security elements with the strapping operation, that is, an application of mechanical and electronic security elements within one apparatus.

5 In this arrangement the applicator may include a dispensing device adapted to apply a security element to one of the overlapping portions for integration into the strapping means. By means of such a dispensing device, for example, a simple dispensing lip, the security elements can be applied to the strapping means before it is fed to the strapping operation, that is, shot into the band guide of the strapping machine. In this event it is necessary for the apparatus of the invention to be controlled by a control unit such that the security elements are applied to the strapping means at appropriate locations and at predetermined relative distances for them to be arranged between the overlapping portions of the strapping means when these are joined together.

15 Alternatively, the applicator may include a positioning device with which a security element needing to be integrated in the strapping means can be positioned intermediate the overlapping portions. This positioning device is arranged and adjustable in such manner that a security element is introduced between the upper and lower layer of the strapping means immediately before the joining together of the two overlapping portions thereof, so that the security element is enclosed between the two overlapping portions of the strapping means during and after the joining operation.

25 Preferably, the apparatus of the invention includes a conveying device by means of which a weldable, band-shaped strapping material as strapping means can be fed to a band guide. The band guide is arranged so as to surround the object at least in part, so that the strapping means forms a loop around the object to be secured.

The security elements may be arranged singly and cut to size in a magazine or wound on a supply reel as a continuous strip. In either event, they can be fed to the applicator rapidly and at short intervals.

30 In an advantageous aspect of the apparatus of the invention, provision may also be made for a feed device for picking up the security elements and feeding them to the applicator.

In cases where a severing device, preferably a cutter, is provided which cuts the security elements to a size corresponding approximately to the length of the overlapping portions, the security elements are presented in a size in which they can be completely enclosed by the overlapping portions.

5 The sealing device may be a friction welding device or an ultrasonic welding device, for example. When in these cases the security element is coated with a meltable material at least in part, then the strapping material and the security element can be welded to one another so that a very firm bond is established which practically prevents the security element from being removed.

10 The security elements are preferably of a strip-shaped configuration and/or arranged on a carrier web. The security elements may include, for example, electromagnetic (EM), acousto-magnetic (AM), radio frequency (RF) or radio frequency identification (RF-ID) elements.

 When the applicator comprises at least an idler roll and a dispensing lip, the
15 security elements can be applied and fed reliably and speedily.

 A particularly effective and trouble-insusceptible operation of the apparatus of the invention is ensured when the strapping means is wound on a supply reel as a band supply and provision is made for a severing device which severs the strapping means from the band supply after its overlapping portions have been joined
20 together.

 The present invention will be explained in more detail in the following by way of example with reference to the Figures of the accompanying drawing. In the drawing,

 FIG. 1 is a schematic representation of an embodiment of the apparatus of
25 the invention;

 FIG. 2 is a schematic representation of another embodiment of an apparatus of the invention;

 FIG. 3 is a schematic representation of an apparatus for carrying out an embodiment of the method of the invention;

FIG. 4 is a perspective view of an object encircled with a strap;

FIG. 5 is a perspective view of the object of FIG. 4 with double strapping;
and

FIG. 6 is a perspective view, similar to FIG. 5, of an object with double
5 strapping, with a security element being made of co-extruded EM material that is
applied to a plastic strapping band in accordance with the detail view A.

FIG. 1 shows an embodiment of an apparatus 1 of the invention for protect-
ing an object 2 against theft. The apparatus 1 includes a band guide 3 provided on
its lower rail 4 with a table 5. The side rails 6, 7 and the upper rail 8 of the band
10 guide 3 are arranged around the table 5, so that an object 2 placed down on the
table 5 is within the boundaries of the band guide 3. The apparatus 1 of the inven-
tion further includes a supply reel 9 for the strapping means 10. The strapping
means 10 involved is a band 11 which may be made of a weldable material, for
example, plastics. The strapping means 10 is drawn from the supply reel 9 by a
15 feed device 12 via an idler roll 13 and fed to a band magazine 14. By means of a
conveying device 15 the band 11 is shot at high velocity from the band magazine 14
into the band guide 3. The free end of the band 11 is captured in the sealing zone
16 and securely fixed in place. Then the running direction of the conveying device
15 is reversed, causing the band 11 to be retracted and to place itself around the
20 object 2 in the form of a loop 17. Finally, the strapping means 10 is tensioned tight
around the object 2 by means of a tensioning device, not shown, which may be an
arrangement of tension rollers, so that the loop 17 rests snugly against the object 2.
Present in the sealing zone 16 are now two oppositely arranged and overlapping
portions of the strapping means 10. Arranged in direct proximity to the space 19
25 between the two overlapping portions of the strapping means 10 is a positioning
device 20. The positioning device 20 is used for feeding electronically detectable
security elements 21 to the sealing zone 16. The positioning device 20 is of the
adjustable type, thus enabling the security elements 21 to be positioned between
the overlapping portions of the strapping means 10. The security elements 21 are
30 affixed to a carrier web 22 by means of an adhesive coating, which web is wound
onto a supply reel 23. Being routed via the positioning device 20, the carrier web 22
with the security elements 21 held thereon is drawn off the supply reel 23 by means
of a feed roll 24. At its end close to the space 19 the positioning device 20 has a

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dispensing lip where the security elements 21 are delaminated from the carrier web 22 and applied to the lower one of the overlapping portions of the strapping means 10 on which they remain adhered by means of the adhesive coating.

5 In an alternative embodiment of the present invention the security elements 21 may also be applied to the upper one of the overlapping portions of the strapping means 10. In either event, with the embodiment of the apparatus 1 of the invention shown in FIG. 1 the security elements 21 are fed to the strapping means during the strapping operation and are positioned between the overlapping portions of the strapping means 10. Once a security element 21 is present between the overlap-
10 ping portions of the strapping means 10, these portions are joined by means of the sealing device 18. The sealing device 18 involved may be, for example, a friction welding device or an ultrasonic welding device which enable the weldable strapping material to be welded together, thereby sealing the loop 17, that is, the strapping means 10.

15 In a special embodiment of the invention the security elements 21 may be additionally covered with a meltable material that melts during the welding of the overlapping portions to one another, hence entering a firm bond with the material of the strapping means 10. After the strapping means 10 is sealed, the security element 21 is enclosed between the overlapping portions of the strapping means 10 in
20 a way not visible from outside, being practically prevented from being detached from the strapping means. Furthermore, the sealing device 18 preferably includes a severing unit that severs the now sealed strapping means 10, meaning the loop 17, from the remaining strapping material, meaning the band supply. On completion of the process of the invention, the loop 17 encircles the object 2, with the loop 17
25 containing a security element 21 invisibly enclosed between the overlapping portions of the strapping means 10. In another embodiment of the invention the object 2 can now be turned through an angle of 90 degrees and strapped again, so that two loops arranged at right angles to one another secure the object 2. Considering that this results in two security elements to be disposed at right angles to each
30 other, this embodiment enables the detection rate to be increased still further. The apparatus 1 of the invention may also include a severing device, for example, a cutter, which cuts the security elements 21 to a length corresponding approximately to the length of the overlapping portions of the strapping means 10. The length to which the security elements are cut should be slightly less than the length of the

overlapping portions in order to ensure that the security elements 21 are completely, that is, invisibly, enclosed between the overlapping portions.

FIG. 2 shows another embodiment of an apparatus 25 of the invention for the protection of an object 2. The apparatus 25 differs from the apparatus 1 of FIG. 1 in that the device for applying security elements essentially comprises a dispensing device 26 by means of which the security elements 27 are applied to the appropriate sections of the strapping means 10 prior to the actual strapping operation. Also in this embodiment the security elements 27 are arranged on a carrier web 28 that is unwound from a supply reel 30 by means of a feed roll 29. In the process the carrier web 28 with the security elements 27 held thereon is routed via the dispensing device 26 having a dispensing lip 31 at its one end. The security elements 27 are delaminated from the carrier web 28 at the dispensing lip 31 and applied to the strapping means 10, meaning the band 11. As this occurs, the apparatus 25 has to be controlled in such fashion that the security elements 27 are applied to a portion of the strapping means 10 that overlaps during the strapping operation with another portion of the strapping means 10, thus enabling a security element 27 to be enclosed between the overlapping portions of the strapping means 10. Accordingly, with the apparatus 25 of the invention the security elements 27 are fed to the strapping means 10 prior to the strapping operation, with the security elements 27 being applied to one of the overlapping portions. For adhering them to the carrier web 28 and the strapping means 10 the security elements 27 may be provided with an adhesive coating, for example. Alternatively, the security elements 27 may also be coated with a meltable material that fuses with the strapping material when the overlapping portions are joined, so that the security elements 27 are very firmly and practically inseparably enclosed between the overlapping portions.

FIG. 3 shows a conventional strapping machine 35 which equally includes a band guide 36 surrounding an object 2 placed down on a table 37. Furthermore, the strapping machine 35 also includes a supply reel 38 for the strapping means 10 from which the strapping means 10 is fed to a band magazine 40 by means of a feed device 39. Here too, the strapping means 10 is shot from the band magazine 40 via a conveying device 41 into the band guide 36 and subsequently sealed by means of the sealing device 42. Similar to the embodiment of FIG. 2, the security elements 43 are fed to the strapping means 10 prior to the strapping operation and applied to portions of the strapping means 10 which overlap during the strapping

operation for joining. For this purpose, in the present embodiment the security elements 43 are already applied to the strapping means 10 at predetermined relative distances and wound onto the supply reel 38 with the strapping means. The advantage of this embodiment resides in that it enables a conventional and, as the case may be, already existing strapping machine 35 to be used for carrying out the method of the invention.

FIG. 4 is a perspective view of an object 45 of the invention, showing a strapping means 46 encircling the object in the form of a loop. The strapping means 46 has a section 47 in which two portions 48, 49 of the strapping means 46 are in overlapping relationship. These portions 48, 49 are firmly joined, preferably welded to one another, with the strapping means 46 being preferably made of a weldable plastics material. Sandwiched between the portions 48, 49 is a strip-shaped security element 50 (shown in dashed lines) which is completely enclosed between the overlapping portions 48, 49 and therefore not visible from outside. The object 45 involved is the packaging 51 of an item of merchandise. On the one hand, the strapping prevents opening of the packaging 51 and a subsequent removal of the item of merchandise, while on the other hand the security element 50 protects the item against unauthorized removal from the sales room.

FIG. 5 shows the object 45 of FIG. 4 which in the present embodiment is additionally secured by another strapping means 52. Enclosed in the strapping means 52 between two overlapping portions 53, 54 is another security element 55. Because the security elements 50 and 55 are arranged at right angles to each other, a higher detection rate results when the object is carried through a zone subject to surveillance.

In all of the above-described cases a strip-shaped security element may be made of co-extruded EM material a defined quantity of which is supplied from a separate supply reel in longitudinal direction of the strapping means. It will be understood, however, that the EM material may also be supplied in any desired direction. At all events, the EM material is introduced between the upper and the lower layer of the strapping means, preferably a plastic band. A welding head as, for example, an ultrasonic head, fuses the strapping means with the EM material.

FIG. 6 shows an object 45 secured by two strapping means 46, 52 as in FIG. 5. Enclosed in the strapping means 52 between the overlapping portions 53,

54 is a security element 55 made of co-extruded EM material. FIG. 6 shows in addition that the individual security element 55 may not only be enclosed in the area of overlap but may also protrude beyond it, as becomes readily apparent from the representation of FIG. 6. When it is stated in the foregoing that the security element is enclosed between the overlapping portions 53, 54 or between other overlapping portions, this does not mean that the security element could not protrude beyond the area of overlap.

The co-extruded EM material has the following structure:

10 In the interior of a plastic coating is either a single element ("simple strip" as known from EP 0 921 942 B1) as deactivatable element or only the active material. The plastic coating is made of commercially available, co-extrudable plastics and may have any desired color or shape.

15 The EM material may be supplied from a supply reel and cut to the appropriate length upon introduction into the welding zone, or the security elements, which are already cut to length, are fed to the welding head one at a time. For this purpose conventional strapping machines may be modified to suit this operation.

List of Reference Numerals

5	1	apparatus
	2	object
	3	band guide
	4	rail
	5	table
10	6	rail
	7	rail
	8	rail
	9	supply reel
	10	strapping means
15	11	band
	12	feed device
	13	idler roll
	14	band magazine
	15	conveying device
20	16	sealing zone
	17	loop
	18	sealing device
	19	space
	20	positioning device
25	21	security element
	22	carrier web
	23	supply reel
	24	feed roll
	25	apparatus
30	26	dispensing device
	27	security element
	28	carrier web
	29	feed roll
	30	supply reel
35	31	dispensing lip

	35	strapping machine
	36	band guide
	37	table
	38	supply reel
5	39	feed device
	40	band magazine
	41	conveying device
	42	sealing device
	43	security element
10	45	object
	46	strapping means
	47	section
	48	portion
	49	portion
15	50	security element
	51	packaging
	52	strapping means
	53	portion
	54	portion
20	55	security element